AN EMPIRICAL STUDY OF FACTORS INFLUENCING CONSUMER ADOPTION INTENTION FOR MOBILE PAYMENT IN MALAYSIA

Soo-Cheng Chuah[1]
Zarina Denan[1]
JS Keshminder Singh[1]
Juliana Noor Kamaruddin[1]

Abstract

The interest in mobile payments is evolving in today's society as a new e-payment mode instead of the conventional cash, check, or credit cards. To this end, the current study investigated the acceptance of mobile payment services in Malaysia, whereby the technology acceptance model (TAM) was extended. This was performed by considering perceived risk factors, perceived value, perceived ease of use, perceived usefulness, and attitude in explaining consumer intention to adopt mobile payment. A sample size of 285 smartphone users was collected through a self-administered questionnaire. The data and subsequent hypotheses were tested by applying the partial least square structural equation modelling technique. The results showed that perceived ease of use, perceived usefulness, perceived value, and attitude were significant components in explaining user behavioural intention to adopt mobile payment services. Of the five facets denoting perceived risk, only perceived privacy risk influenced perceived value and eventually affected user adoption intention significantly. The mediating role of perceived usefulness and attitude towards mobile payment adoption was also identified as significant in the study. In sum, mobile technology usefulness renders the payment process faster and more convenient as users are only required to scan the QR code. Accordingly, mobile service providers should work towards increasing consumer confidence in their client privacy protection policies.

Keywords: Adoption intention; Mobile payment; Technology Acceptance Model (TAM); Attitude

Abstrak

Minat pembayaran mudah alih berkembang dalam masyarakat hari ini sebagai mod e-pembayaran baru dan bukan secara tunai, cek, atau kad kredit konvensional. Untuk tujuan ini, kajian semasa mengkaji penerimaan perkhidmatan pembayaran mudah

[1]*Department of Economics and Financial Studies, Faculty of Business and Management, University Teknologi MARA Selangor Branch, Malaysia*

alih di Malaysia, di mana model penerimaan teknologi (TAM) diperluas. Ini dilakukan dengan mempertimbangkan faktor risiko yang ditanggapi, nilai yang ditanggapi, kemudahan penggunaan yang ditanggapi, kegunaan yang ditanggapi, dan sikap dalam menjelaskan niat pengguna untuk menggunakan pembayaran mudah alih. Saiz sampel 285 pengguna telefon pintar dikumpulkan melalui soal selidik yang ditadbir sendiri. Data dan hipotesis seterusnya diuji dengan menggunakan teknik partial least square structural equation modelling. Hasil kajian menunjukkan bahawa kemudahan penggunaan yang ditanggapi, kegunaan yang ditanggapi, nilai yang ditanggapi, dan sikap merupakan komponen penting dalam menjelaskan niat perilaku pengguna untuk menggunakan perkhidmatan pembayaran mudah alih. Dari lima aspek yang menunjukkan risiko yang ditanggapi, hanya risiko privasi yang ditanggapi mempengaruhi nilai yang ditanggapi dan akhirnya secara signifikan mempengaruhi niat penggunaan pengguna. Peranan perantara kegunaan yang ditanggapi dan sikap terhadap penggunaan pembayaran mudah alih juga dikenal pasti signifikan dalam kajian ini. Ringkasnya, kegunaan teknologi mudah alih menjadikan proses pembayaran lebih cepat dan lebih mudah kerana pengguna hanya diminta mengimbas kod QR. Oleh itu, penyedia perkhidmatan mudah alih harus berusaha meningkatkan keyakinan pengguna terhadap dasar perlindungan privasi pelanggan mereka.

Kata kunci: Niat penggunaan; Pembayaran mudah alih; Model Penerimaan Teknologi (TAM); Sikap

Introduction

The rapid development of information systems and wireless communication technologies has driven today's technology revolution, especially with the prevalent usage of mobile devices and applications (otherwise known as apps). Here, mobile phones have emerged as an increasingly and widely implemented mobile device technology utilised by individuals. It is a fundamental and primary platform for the delivery of mobile services or apps. Accordingly, mobile payment is among the mobile services developed to facilitate everyday transaction mechanisms. In general, it refers to the payment of goods, services, and bills by using mobile devices and other communication technologies (Dahlberg *et al*., 2008). Thus, the service typically allows mobile device owners to easily and conveniently undertake payments and transfer funds by using their phones personally.

To date, Malaysia has yet to reach the critical stage of mobile payment adoption and diffusion as the emerging status of such services render them less widely implemented by users in the country. Compared to traditional payment modes, this situation has been observed, such as cash, credit card, and debit card. According to the e-Commerce Consumers Survey 2018, third-party online payment services account for a mere 8.2% in the context of e-commerce payments in the domestic

market. Moreover, contrary to other digital consumer commerce transactions via credit cards, debit cards, online payment providers, or others, mobile payments carried out at the point-of-sale (POS) through smartphones have remained relatively low. As of the year 2019, mobile POS payments amounted to US$466.9 million only, while digital commerce recorded a total of US$9640.4 million. This reflects mobile payment as a non-critical driver for a thriving mobile commerce climate in Malaysia, despite its role behind the transformation wave upheld by Bank Negara Malaysia in promoting e-payments. Regardless, the government can be credited for their efforts in driving and necessitating mobile payment adoption, specifically via credit provision through e-wallet according to national fiscal allocation. Thus, it is vital to identify what are the factors determining users' acceptance of mobile payments.

Besides, user adoption of mobile payment denotes an emerging service that has received considerable scholarly attention, particularly given the risk involved in the mechanism to a certain extent. For example, Kim et al. (2010) have underlined the effect of individual differences and mobile payment system characteristics on mobile payment usage intention among users through the variables of perceived usefulness and perceived ease of use. Similarly, perceived risk and trust also impact consumer acceptance of mobile payment systems (Shin, 2010), especially e-commerce. Risk, in particular, is an imminent factor causing users' acceptance of mobile payment. This study fills the gap by examining users' multiple dimensions of perceived risk towards their perceived value in adopting mobile payments. There is a lack of studies on numerous dimensions of perceived risk. Thus, this study examines the effects of perceived risk, perceived value, perceived ease of use, and perceived usefulness on the behavioural intention towards the adoption of mobile payment services.

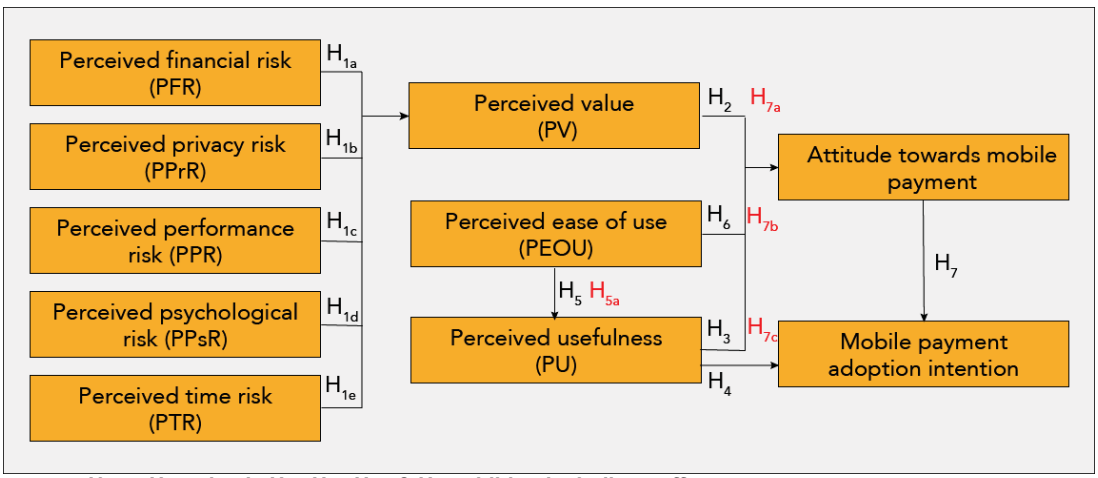
Literature Review

Over time, various technology adoption theories have been developed and applied in research studies to investigate individual intention for adopting newly-developed technologies. They include Innovation Diffusion Theory (IDT); Theory of Reasoned Action (TRA) (Fishbein & Ajzen, 1977); Theory of Planned Behaviour (TPB) (Ajzen, 1991); Technology Acceptance Model (TAM) (Davis, 1989); and Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh, Morris, Davis & Davis, 2003).

In general, TAM is the most broadly implemented model in research to investigate the technology acceptance behaviour for new technology innovation. It is exceptionally robust in explaining and predicting consumer behavioural intention and the application of new technologies (Davis, 1989; Zhang, Zhu, Zhu, & Liu, 2012). The theory is particularly applicable for mobile payment services due to their novelty as a new technology that offers a new way of making transactions and payments. Previously, Davis (1989) developed TAM for predicting user acceptance and adoption

level in new information systems and technology. The attitudes towards technology can be identified using two crucial factors in the model: perceived ease of use and perceived usefulness. Accordingly, model extensions have been made by including other acceptance factors to ensure better predictions of user behaviour across various disciplines in terms of technology innovation application.

Furthermore, this study contains the different risk aspects by highlighting the relationship with consumers' perceived value towards intention to adopt mobile payment. Henceforth, this study adopts the TAM, which is extended by implementing the elements of perceived value and perceived risk in the model. The proposed conceptual model is shown in Figure 1.



Note: Hypothesis H_{5a}, H_{7a}, H_{7b}, & H_{7c} exhibits the indirect effect

Figure 1: Proposed Conceptual Model

Perceived risk of mobile payment

Following Yang, Liu, Li, and Yu's (2015) study, the current research measures five dimensions denoting perceived risk: perceived financial risk, perceived privacy risk, perceived performance risk, perceived psychological risk, and perceived time risk. This is performed as per the hypothesis underlined by Featherman and Pavlou (2003) in measuring e-service adoption. Yang et al. (2015) examined the five dimensions of perceived risk on perceived value and further acceptance intention of mobile payments.

Perceived financial risk

Perceived financial risk (PRF) generally refers to consumer consciousness regarding any potential issues of financial loss due to fraud that may happen in the process of

e-services adoption (Featherman & Pavlou, 2003), specifically for mobile payment (Yang *et al*., 2015). For example, the security in carrying out money transfers during the transaction payment process when utilizing mobile payments may divert the attention to disclosing personal financial information (e.g., account and password), thus potentially increasing the risk of money loss. Besides, the application of wireless communication technologies may further amplify the risks of financial information exposure (Yang *et al*., 2015).

Perceived privacy risk

Perceived privacy risk (PPrR) ascribes to the consumer perception of possibly private information divulgence (Featherman & Pavlou, 2003). In general, consumers have concerns about their confidential information during mobile payment adoption processes. This concern is driven by the possibility that their privacy is violated, namely through disclosure, transmission, or sales of personal data to third-party providers without user permission, as well as hacker interception (Yang *et al*., 2015).

Perceived performance risk

Perceived performance risk (PPR) describes user consciousness on any e-service system malfunctions (Featherman & Pavlou, 2003). It has been delineated explicitly in mobile payment services (Yang *et al*., 2015) following their performance that fails to reach user expectations. In this case, mobile payment performance may be affected by low and unstable internet communication speed and the availability of a wireless network, possibly resulting in system failure and unsuccessful payment transactions.

Perceived psychological risk

Perceived psychological risk (PPsR) outlines psychological symptoms (e.g., frustration, pressure, and anxiety) expressed by users in adopting mobile payment (Lim, 2003). Due to its relative newness as a payment service in Malaysia, users may face difficulties operating associated mobile apps; this may elicit psychological anxiety for any non-performing services.

Perceived time risk

Perceived time risk (PTR) refers to the time loss consumers face during their learning and understanding of operating and using mobile payment as the payment mode. They will need to digest such information to perform transactions such as paying bills, transferring money, and cancelling the transaction if the mobile app performance is subpar (Yang *et al*., 2015). This may occur if the mobile apps do not perform successfully and efficiently due to their loading speed or the network non-capability to

handle the transactions (Yang *et al*., 2015). For example, a long process time to perform any transactions may yield some inconvenience for consumers.

The following hypotheses are proposed to examine the perceived risk dimensions in adopting mobile payment:

H_{1a}: Perceived financial risk has a negative effect on the perceived value in mobile payment adoption intention.
H_{1b}: Perceived privacy risk has a negative effect on the perceived value in mobile payment adoption intention.
H_{1c}: Perceived performance risk has a negative effect on the perceived value in mobile payment adoption intention.
H_{1d}: Perceived psychological risk has a negative effect on the perceived value in mobile payment adoption intention.
H_{1e}: Perceived time risk has a negative effect on the perceived value in mobile payment adoption intention.

Perceived value

According to the prospect theory, subjective value influences the decision-making process of an individual in line with the perceived value theory (Kahneman & Tversky, 1979). Perceived value (PV) refers to consumer perception of expected benefits and sacrifices in adopting mobile payment (Kim *et al*., 2007; Yang *et al*., 2015). Alternatively, Zaithaml (1988) has posited PV as a general judgment held by consumers when consuming a product or service pertaining to its utility by considering the associated benefits and sacrifices. Past studies have generated findings supporting its significant impact on the attitude to apply mobile apps (Hajiha, Shahriari, & Vakilian, 2014; Ng, Ho, Lim, Chong, & Latiff, 2019). Thus, the study proposes the following hypothesis:

H_2: Perceived value has a positive effect on the attitude towards the adoption of mobile payment.

Perceived usefulness

Perceived usefulness can be defined as “the degree to which a person believes that using a particular system would enhance his or her job performance” (Davis, 1989, p. 320). Thus, it indicates an individual’s belief that mobile payment will amplify their ability towards task accomplishment. Accordingly, the variable measures user readiness to adopt a new service instead of traditional services if it attributes more desirable benefits (Awamieh & Fernandes, 2005; Tan & Teo, 2000), enabling them to perform more efficiently.

Furthermore, perceived usefulness is highly correlated with the actual adoption behaviour towards technology information systems (Robey, 1979). Here, the diffusion theory by Roger (1995) posits that the consumer acceptance level for innovation is subject to the benefits subsequently obtained by them. In line with this, past studies have shown that perceived usefulness is positively related to the intention to adopt mobile payment (Kim *et al.,* 2010; Chen, 2008; Pham & Ho, 2015; Ibrahim, Hussin, & Hussin, 2019). In the context of mobile payment services adoption, however, the dimension explicates the integration level of the mechanism in enhancing consumer performance in their daily life activities. Accordingly, mobile payment is notably helpful in fulfilling the payment and financial transaction needs of users, leading to the following hypothesis applied in this study, namely:

H_3: Perceived usefulness has a positive effect on the attitude towards the adoption of mobile payment.
H_4: Perceived usefulness has a positive effect on the intention to adopt mobile payment.

Ease of use

In general, perceived ease of use (PEOU) describes "the degree to which a person believes that using a particular system would be free from effort" (Davis, 1989). Therefore, it is a crucial antecedent influencing the level of acceptance for a new information technology application (Venkatesh & Davis, 2000; Kim *et al*., 2010). For example, past studies have highlighted its statistically significant impact on attitude whether directly (Chau & Lai, 2003; Hernandex, Jiménez & Martin, 2010; Bailey, Pentina, Mishra, & Maimoun, 2017) or indirectly through perceived usefulness (Yang, 2005, 2012; de Luna, Montoro-Ríos, Liébana-Cabanillas, & de Luna, 2016; Chandra *et al*., 2010). Therefore, this study proposes the following hypotheses:

H_5: Perceived ease of use has a positive effect on perceived usefulness in the adoption of mobile payment.
H_{5a}: Perceived ease of use has an indirect effect on the intention to adopt mobile payment through its effect on perceived usefulness towards mobile payment adoption.
H_6: Perceived ease of use has a positive effect on attitude towards the adoption of mobile payment.

Attitude towards mobile payment

Attitude is the extent of favourable or unfavourable assessment delineating individual behaviour towards technology (Schierz, Scilke, & Wirtz, 2010). Its inclusion in the research model is due to explaining the technology adoption intention (Ha & Stoel, 2009; Schierz *et al*., 2010; Yang, 2012), specifically in terms of mobile payment (de

Luna *et al*., 2016; Aslam, Ham, & Arif, 2017; Bailey, Pentina, Mishra, & Maimoun, 2017). Accordingly, a positive relationship has been established between attitude towards the usage and intention to utilise technological innovation. Therefore, the attitude towards technology innovation adoption is denoted as the primary driver and mediator influencing the behavioural intention for adoption. Furthermore, in this study, the adoption attitude towards mobile payment is influenced by consumer perception of its ease of use, usefulness, and values, which will further the behavioural intention for adoption. Therefore, this study derives the following hypotheses accordingly:

H_7: Attitude towards mobile payment has a positive effect on the intention to adopt mobile payment.
H_{7a}: Perceived value has an indirect effect on the intention to adopt mobile payment through its effect on attitude towards mobile payment adoption.
H_{7b}: Perceived ease of use has an indirect effect on the intention to adopt mobile payment through its effect on attitude towards mobile payment adoption.
H_{7c}: Perceived usefulness has an indirect effect on the intention to adopt mobile payment through its effect on attitude towards mobile payment adoption.

Research Methodology

This study employed a quantitative non-probability convenience sampling method to gather pertinent data through a self-administered questionnaire disseminated among smartphone users in the Klang Valley, Malaysia. The sample size was computed using G-Power version 3.1 (Faul, Erdfelder, Lang, & Bucher, 2007), yielding a minimum number of 126 when calculated via the power of 0.85 with an effect size of 0.15 following Cohen's (1988) suggestion for social and behavioural science research. However, a total of 285 questionnaires were collected in this study.

Research instrument/ measurement

A multi-item scale questionnaire was established to measure the constructs tested in this study using a 5-point Likert scale ranging from 1 = strongly disagree to 5 = strongly agree. The construct measurement was adapted from existing studies in line with the dimensions and items. For example, the measurement items related to perceived risk dimensions of perceived financial risk (i.e., four items), perceived privacy risk (i.e., four items), perceived performance risk (i.e., four items), perceived psychological risk (i.e., three items), and perceived time risk (i.e., four items) were adopted from Featherman and Pavlou (2003) and Yang *et al*. (2015). Meanwhile, the perceived value was measured using four items adapted from Kim and Chan *et al.* (2007) and Yang *et al*. (2015). In contrast, five items were employed to assess perceived usefulness as adapted from the works of Phonthanukitithaworn, Sellitto, and Fong (2015) and Kim, Shin and Lee (2009). Alternatively, the measurement items for perceived ease of use (i.e., four items) were adapted from de Luna *et al*.

(2016) and Kim *et al*. (2009), while attitude required four items adapted from de Luna *et al.* (2016). Finally, the last construct of behavioural intention included five measurement items adapted from de Luna *et al*. (2016) and Kim *et al.* (2010).

Furthermore, Web power online multivariate normality was applied to examine the data distribution included in the study. Accordingly, Mardia's multivariate skewness and kurtosis output supported the alternative hypothesis of multivariate non-normality as the resulting p-value was less than 0.05.

Similarly, structural equation modelling – partial least squares (PLS-SEM) was employed to test the study hypotheses following the data confirmed to be non-normality distributed. It was performed using SmartPLS version 3.2.8 (Ringle, Wende, & Becker, 2015), which denoted analysis of the measurement model (i.e., validity and reliability) and structural model (i.e., the relationship among variables).

Data Analysis

Socio-demographic characteristics

Table 1 presents an analysis of the socio-demographic characteristics among the study respondents. As shown, almost two-thirds of them were females, while most were within the age range of 20 to 29-year, delineating their status as millennials equipped with technology-savvy skills and knowledge. Furthermore, the demographic ethnicity was similar to the general Malaysian population structure, namely 66 percent of Malay, 21.8 percent of Chinese, and seven percent of Indian respondents. Besides, most respondents completed their tertiary education and belonged to the M40 and T20 income groups.

Table 1: Socio-demographic Analysis

Item	Frequency	Percentage (%)
Gender		
Male	95	33.3
Female	190	66.7
Age		
Below 20 years old	5	1.8
20–29 years old	126	44.2
30–39 years old	74	26.0
40–49 years old	44	15.4
50–59 years old	30	10.5
60 years old and above	6	2.1

Table 1 (continues)

Item	Frequency	Percentage (%)
Marital Status		
Married	155	54.4
Single	125	43.9
Widow	5	1.8
Race		
Malay	188	66.0
Chinese	62	21.8
Indian	20	7.0
Others	15	5.3
Education Level		
SPM or less	42	14.7
Diploma	85	29.8
Bachelor's Degree	105	36.8
Master's or above	53	18.6
Household Income Level (Monthly)		
Less than RM3000	103	36.1
RM3000 – RM4999	81	28.4
RM5000 – RM9999	62	21.8
RM10000 and above	39	13.7

Measurement model

The reliability and validity of the construct items included in the research model were measured via convergent and discriminant validity. Convergent validity could be assessed in terms of the factor loading, average variance extracted (AVE), and composite reliability (CR).

Table 2 presents convergent validity results, whereby the factor loading for the tested items is higher than 0.5. Similarly, the values of AVE and CR were greater than 0.5 and 0.7, respectively, fulfilling the threshold suggested by Hair *et al.* (2017). This indicated that the convergent validity of the constructs measured was satisfactory.

Table 2: Convergent Validity

Variable	Items	Loadings	AVE	CR
Perceived Financial Risk	PFR1	0.811	0.698	0.902
	PFR2	0.814		
	PFR3	0.88		
	PFR4	0.835		

Table 2 (continues)

Variable	Items	Loadings	AVE	CR
Perceived Performance Risk	PPR1	0.833	0.773	0.935
	PPR2	0.891		
	PPR3	0.897		
	PPR4	0.895		
Perceived Psychological Risk	PPsR1	0.908	0.762	0.905
	PPsR2	0.902		
	PPsR3	0.805		
Perceived Privacy Risk	PPrR1	0.844	0.783	0.935
	PPrR2	0.909		
	PPrR3	0.888		
	PPrR4	0.897		
Perceived Time Risk	PTR1	0.944	0.798	0.887
	PTR3	0.84		
Perceived Value	PV1	0.763	0.701	0.903
	PV2	0.867		
	PV3	0.796		
	PV4	0.916		
Perceived Usefulness	PU1	0.827	0.646	0.901
	PU2	0.819		
	PU3	0.864		
	PU4	0.723		
	PU5	0.777		
Perceived Ease of Use	PEOU1	0.798	0.713	0.925
	PEOU2	0.843		
	PEOU3	0.867		
	PEOU4	0.881		
	PEOU5	0.832		
Attitude	Att1	0.838	0.748	0.922
	Att2	0.846		
	Att3	0.902		
	Att4	0.873		

Table 2 (continues)

Variable	Items	Loadings	AVE	CR
Behavioural Intention	BI1	0.905	0.855	0.967
	BI2	0.947		
	BI3	0.95		
	BI4	0.936		
	BI5	0.885		

Alternatively, the measurement model's discriminant validity was assessed using the Heterotrait–Monotrait Ratio (HTMT) criterion as displayed in table 3, which yielded values less than the threshold of 0.85. Such an outcome revealed that the discriminant validity was satisfactorily met.

Table 3: Heterotrait–Monotrait Ratio (HTMT) Criterion

	Attitude	BI	PEOU	PFR	PPR	PPrR	PPsR	PTR	PU	PV
Attitude										
BI	0.821									
PEOU	0.643	0.683								
PFR	0.275	0.135	0.128							
PPR	0.206	0.172	0.093	0.606						
PPrR	0.406	0.256	0.271	0.736	0.631					
PPsR	0.232	0.189	0.119	0.623	0.852	0.622				
PTR	0.266	0.164	0.144	0.591	0.77	0.642	0.806			
PU	0.685	0.741	0.83	0.237	0.148	0.331	0.171	0.203		
PV	0.553	0.57	0.697	0.205	0.289	0.421	0.284	0.297	0.643	

Structural Model

Assessing the structural model was initiated by determining the variance inflation factor (VIF), which would indicate the existence of multicollinearity. Accordingly, the study constructs generated VIF values less than 5, revealing no collinearity issues present in the latent variable (Hair *et al*., 2017). Then, the bootstrapping procedure was employed with a resample of 5,000 (Hair *et al*., 2017) to obtain the t-values, p-values, bootstrapped confidence intervals, R^2, predictive relevance (Q^2), and effect sizes (f^2).

Table 4 depicts the hypothesis testing performed in the study, which reveals the direct effects with the overall fit statistics. Here, perceived financial risk (H_{1a}: β = -0.120, t = 1.560, p > 0.05); perceived performance risk (H_{1c}: β = 0.043, t = 0.415, p > 0.05); perceived psychological risk (H_{1d}: β = 0.033, t = 0.314, p > 0.05); and perceived time risk (H_{1e}: β = 0.054, t = 0.581, p > 0.05) were found to be not significantly related to perceived value. Contrary to this, only perceived privacy risk (H_{1b}: β = -0.385, t = 4.246, p < 0.05) was found to be significantly and negatively related to the same variable.

Meanwhile, perceived value (H_2: β = 0.385, t = 4.246, p < 0.01) posed a significant and positive influence on attitude towards mobile payment adoption. Similarly, TAM integration revealed that perceived usefulness (H_3: β = 0.349, t = 4.501, p < 0.01) and perceived ease of use (H_6: β = 0.225, t = 3.209, p < 0.01) were significant and positive predictors of attitude towards mobile payment adoption. Furthermore, perceived ease of use (H_5: β = 0.735, t = 20.394, p < 0.01) generated a significant positive influence on perceived usefulness. Besides, perceived usefulness (H_4: β = 0.346, t = 4.501, p < 0.01) also significantly and positively impacted the behavioural intention along with attitude (H_7: β = 0.550, t = 10.384, p < 0.01). Thus, hypotheses H_{1b}, H_2, H_3, H_4, H_5, H_6, H_7 were supported.

Moreover, Table 4 also shows the confidence interval, confirming the significance of the structural path coefficients. For example, the values of R^2 (i.e., 0.155, 0.417, 0.539, and 0.651) indicated that the structured model explained 65.1 percent of the variance regarding the behavioural intention, 53.9 percent of perceived usefulness, 41.7 percent of attitude, and 15.5 percent of perceived value towards adopting mobile payment (Table 5).

Table 4: Structural Model

Hypotheses		Std Beta	Std error	t-value	p-value	BCI LL	BCI UL	Decision
H_{1a}	PFR → PV	-0.120	0.077	1.560	0.060	-0.291	0.031	Not supported
H_{1b}	PPrR → PV	-0.385	0.091	4.246	0.000	-0.248	-0.543	Supported
H_{1c}	PPR → PV	0.043	0.103	0.415	0.339	-0.128	0.222	Not supported
H_{1d}	PPsR → PV	0.033	0.106	0.314	0.377	-0.150	0.191	Not supported
H_{1e}	PTR → PV	0.054	0.093	0.581	0.281	-0.076	0.220	Not supported
H_2	PV → ATT	0.158	0.058	2.740	0.003	0.068	0.255	Supported
H_3	PU → ATT	0.349	0.077	4.501	0.000	0.214	0.468	Supported

Table 4 (continues)

Hypotheses		Std Beta	Std error	t-value	p-value	BCI LL	BCI UL	Decision
H_4	PU → BI	0.346	0.055	4.501	0.000	0.266	0.442	Supported
H_5	PEOU → PU	0.735	0.036	20.394	0.000	0.657	0.780	Supported
H_6	PEOU → ATT	0.225	0.070	3.209	0.001	0.099	0.324	Supported
H_7	ATT → BI	0.550	0.053	10.384	0.000	0.447	0.629	Supported

As depicted, the predictive model relevance is determined using the blindfolding procedure, whereby the Stone-Geisser Q^2 value generated by the constructs is shown in Table 5. Here, all Q^2 values were greater than 0, indicating the predictive relevance held by the model.

Table 5: R^2, f^2, and Q^2

Hypotheses		R^2	f^2	Q^2
H_{1a}	PFR → PV	0.155	0.009	0.098
H_{1b}	PPrR → PV		0.085	
H_{1c}	PPR → PV		0.001	
H_{1d}	PPsR → PV		0.001	
H_{1e}	PTR → PV		0.002	
H_2	PV → ATT	0.417	0.026	0.290
H_3	PU → ATT		0.092	
H_4	PU → BI		0.218	
H_5	PEOU → PU	0.539	1.172	0.325
H_6	PEOU → ATT		0.035	
H_7	ATT → BI	0.651	0.552	0.517

Multiple mediating effect test

Next, the mediating role of perceived usefulness and attitude towards mobile payment adoption (i.e., H_{5a}, H_{7a}, H_{7b}, H_{7c}) was tested in the study accordingly. This was performed by employing the bootstrapping procedure via bias correction to examine the specific indirect effects. Table 6 shows the outcomes of specific indirect effects generated by the exogenous variables (i.e., PV, PEOU, and PU) on the behavioural intention through the mediators proposed in the conceptual model.

Table 6: Specific Indirect Effects

Hypotheses		Std beta	Std error	t-value	p-value	BCI LL 2.5%	BCI UL 97.5%	Decision
H_{5a}	PEOU → PU → BI	0.254	0.045	5.695	0.000	0.165	0.339	Supported

Table 6 (continues)

Hypotheses		Std beta	Std error	t-value	p-value	BCI LL 2.5%	BCI UL 97.5%	Decision
H_{7a}	PV → ATT → BI	0.087	0.034	2.524	0.012	0.02	0.154	Supported
H_{7b}	PEOU → ATT → BI	0.124	0.04	3.122	0.002	0.052	0.203	Supported
H_{7c}	PU → ATT → BI	0.192	0.044	4.380	0.000	0.106	0.276	Supported

Additionally, the results revealed that the indirect effects of exogenous variables tested in the study were significantly supported. For example, attitude mediated the relationship between perceived value and behavioural intention (H_{7a}: $\beta = 0.087$, $t = 2.524$, $p < 0.05$), perceived ease of use and behavioural intention (H_{7b}: $\beta = 0.124$, $t = 3.122$, $p < 0.01$), and perceived usefulness and behavioural intention (H_{7c}: $\beta = 0.192$, $t = 4.380$, $p < 0.01$). Moreover, perceived usefulness also mediated the relationship between perceived ease of use and behavioural intention (H_{5a}: $\beta = 0.254$, $t = 5.695$, $p < 0.01$). Thus, hypotheses H_{5a}, H_{7a}, H_{7b}, and H_{7c} were supported.

Discussion and Implications

This study examined the factors influencing Malaysian consumers' intentions to adopt mobile payment services. The conceptual model integrated the TAM by including the factors of perceived risk and perceived value. Henceforth, the model analysis revealed that consumer perception towards perceived value, perceived ease of use, and perceived usefulness had a statistically significant effect on the behavioural intention in adopting such services. However, only perceived privacy risk significantly influenced the perceived value among the five dimensions of perceived risk. This implies that these consumers are more concerned about the risks of personal information disclosed to a third party or misuse by mobile payment services providers than other types of risks.

Furthermore, perceived value, perceived ease of use, and perceived usefulness generate a significant positive effect on consumer attitude towards mobile payment adoption, which is consistent with the findings of Bailey et al. (2017). Perceived usefulness was the most notable factor affecting the attitude towards the adoption compared to perceived value and perceived ease of use. This indicates that the users of mobile payment services are more concerned with the usefulness of the technology being positioned, such as faster and highly convenient payment processes.

As depicted in TAM implementation in this study, perceived ease of use also significantly affects the perceived usefulness in line with previous findings (Kim *et al*., 2010; Lwoga & Lwoga, 2017; Zarmpou *et al*., 2012). If consumers perceive mobile payment as an easy application and apply its use in conducting their financial transactions, they tend to believe it to be a useful and user-friendly service facilitating their performance (Davis, 1989; Kim *et al*., 2010; Lwoga & Lwoga; 2017).

Meanwhile, perceived usefulness is another variable that generates a significant and direct effect on the intention to adopt mobile payment services, thus confirming previous studies (Kim *et al*., 2010; Lwoga & Lwoga, 2017; Zarmpou *et al*., 2012). For example, suppose consumers highly perceive the payment mode as useful in performing financial transactions compared to the conventional cash and credit card usage. In that case, they will have a higher intention of switching to the newly-positioned mobile payment services.

Besides, attitude towards mobile payment adoption is significantly positive in explaining consumer intention to adopt mobile payment services, consistent with the findings of previous studies (Bailey *et al*., 2017; Schierz *et al*., 2010). Attitude towards mobile payment yielded significant outcomes in mediating the effects of perceived value, perceived usefulness, and perceived ease of use on the intention to adopt the mechanism. Additionally, perceived ease of use also posed indirect effects on the intention to adopt mobile payment through perceived usefulness, as depicted in the TAM.

Accordingly, the results of this study provide valuable insights into consumer intention for adopting mobile payment services. First, they indicate consumer concerns regarding the benefits of the emerging technology, wherein mobile payment service providers thus offer loyalty reward programmes to enhance the value of its adoption. Second, consumers highlight privacy risks as a concern in the adoption process. Service providers and the local authorities may build their confidence by upholding the associated privacy protection policy for such services.

Conclusion

In this study, an extended TAM was proposed and empirically tested by examining the effects of five perceived risk dimensions and the antecedents in mobile payment acceptance. Among the five measures, only perceived privacy risk was significantly negative in association with perceived value. Meanwhile, the factors of perceived ease of use, perceived usefulness, and attitude yielded significant effects on the behavioural intention to adopt mobile payment services. Concurrently, attitude towards mobile payment and perceived usefulness were underlined as significant mediators in the research model, as shown by the analysis performed.

References

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, *50*(2), 179–211.

Aslam, A., Ham, M., & Arif, I. (2017). Consumer behavioral intentions towards mobile payment services: An empirical analysis in Pakistan. *Trziste*, *29*(2), 161–176.

Awamleh, R., & Fernandes, C. (2005). Internet banking: An empirical investigation into the extent of adoption by banks and the determinants of customer satisfaction in the United Arab Emirates. *The Journal of Internet Banking and Commerce*, *10*(1), 1–12.

Bailey, A. A., Pentina, I., Mishra, A. S., & Mimoun, M. S. B. (2017). Mobile payments adoption by US consumers: An extended TAM. *International Journal of Retail and Distribution Management*, *45*(6), 1–15.

Chandra, S., Srivastava, S. C., & Theng, Y. (2010). Evaluating the role of trust in consumer adoption of mobile payment systems: An empirical analysis. *Communications of the Association for Information Systems*, *27*(10), 561–588.

Chau, P. Y. K., & Lai, V. S. K. (2003). An empirical investigation of the determinants of user acceptance of internet banking. *Journal of Organizational Computing and Electronic Commerce*, *13*(2), 123–145.

Chen, L. D. (2008). A model of consumer acceptance of mobile payment. *Journal of Mobile Communication*, *6*(1), 32–52.

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Lawrence Erlbaum Associates, Publishers.

Dahlberg, T., Mallat, N., Ondrus, J., & Zmijewska, A. (2008). Past, present and future of mobile payments research: A literature review. *Electronic Commerce Research and Application*, *7*(2), 165–181.

Davis, F. D. (1989). Perceived usefulness, Perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, *13*(3), 319–340.

De Luna, I., Ríos, F., Liébana-Cabanillas, F., & de Luna, J. (2016). NFC technology acceptance for mobile payments: A Brazilian Perspective. *Review of Business Management*, *19.* 10.7819/rbgn.v0i0.2315.

Faul, F., Erdfelder E., Lang, A. G., & Buchner, A. (2007). G*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods*, *39*(2), 175–191.

Featherman, M. S., & Pavlou, P. A. (2003). Predicting e-services adoption: A perceived risk facts perceptive. *International Journal of Human-Computer Studies*, *59*(4), 451–474.

Fishbein, M. & Ajzen, I. (1977). Attitude-Behavior relations: A theoretical analysis and review of empirical research. *Psychological Bulletin*, *84*(5), 888–918.

Ha, S., & Stoel, L. (2009). Consumer e-shopping acceptance: Antecedents in a technology acceptance model. *Journal of Business Research*, *62*(5), 565–571.

Hair, Jr, J. F., Hult, G. T. M., Ringle, C., & Sarstedt, M. (2017). *A Primer of Partial Least Squares Structural Equation Modeling (PLS-SEM) (2nd ed.)*. Sage.

Hajiha, A., Shahriari, M., & Vakilian, N. (2014). The role of perceived value on customer E-shopping intention using technology acceptance model. *2014 IEEE International Conference on Industrial Engineering and Engineering Management*, 1136–1140. Retrieved from DOI: 10.1109/IEEM.2014.7058816

Hernández, B., Jiménez, J., & Martín, M. J. (2010). Customer behavior in electronic commerce: The moderating effect of e-purchasing experience. *Journal of Business Research*, *63*(9–10), 964–971. https://doi.org/10.1016/j.jbusres.2009.01.019

Ibrahim, M., H., Hussin, S. R., & Hussin, S. H. (2019). Factors influencing Malaysian consumers' intention to use Quick Response (QR) mobile payment. *Jurnal Pengurusan*, *57*, 1–16.

Kahneman D., & Tversky. A. (1979). Prospect theory: An analysis of decision under risk. *Econometrica*, *47*(2), 263–292.

Kim, C., Mirusmonov, M., & Lee, I. (2010). An empirical examination of factors influencing the intention to use mobile payment. *Computers in Human Behavior*, *26*(3), 310–322.

Kim, G., Shin, B., & Lee, H. G. (2009). Understanding dynamics between initial trust and usage intentions of mobile banking. *Information Systems Journal*, *19*(3), 283–311.

Kim, H., Chan, H. C., & Gupta, S. (2007). Value-based adoption of mobile internet: An empirical investigation. *Decision Support Systems*, *43*(1), 111–126.

Lim, N. (2003). Consumers' perceived risk: sources versus consequences. *Electronic Commerce Research and Applications*, *2*(3), 216–228.

Lwoga, E. T. & Lwoga, N. B. (2017). User acceptance of mobile payment: The effects of user-centric security, system characteristics and gender. *Electronic Journal of Information Systems in Developing Countries*, *81*(1), 1–24. https://doi.org/10.1002/j.1681-4835.2017.tb00595.x

Ng, S. I., Ho, J. A., Lim, X. J., Chong, K. L., & Latiff, K. (2019). Mirror, mirror on the wall, are we ready for Gen-Z in marketplace? A study of smart retailing technology in Malaysia. *Young Consumers*, *22* (1). https://doi.org/10.1108/YC-06-2019-1006

Pham, T-T. T., & Ho, J. C. (2015). The effects of product-related, personal-related factors and attractiveness of alternatives on consumer adoption of NFC-based mobile payments. *Technology in Society*, *45*(159–172).

Phonthanukitithaworn, C., Sellitto, C., & Fong, M. (2015). User intentions to adopt mobile payment services: A study of early adopters in Thailand. *Journal of Internet Banking and Commerce*, *20*(1), 1–29.

Ramos-de-Luna, I., Montoro-Ríos, F., Liébana-Cabanillas, F., & Luna, J. G. de. (2017). NFC technology acceptance for mobile payments: A Brazilian perspective. *Review of Business Management*, *19*(63), 82–103. https://doi.org/10.7819/rbgn.v0i0.2315

Ringle, C. M., Wende, S., & Becker, J. -M. (2015). SmartPLS 3. Retrieved from http://www.smartpls.com

Robey, D. (1979). User attitudes and management information system use. *Academy of Management Journal*, *22*(3), 527–538.

Rogers, E. M. (1995). *Diffusion of innovations*. New York: Free Press.

Schierz, P. G., Scilke, O., & Wirtz, B. W. (2010). Understanding consumer acceptance of mobile payment services: An empirical analysis. *Electronic Commerce Research and Applications Special Issue: Nomadic and Mobile Computing*, *9*(3), 209–216.

Shin, D. H. (2010). Modeling the interaction of users and mobile payment system: Conceptual framework. *International Journal of Human-Computer Interaction*, *26*(10), 917–940.

Tan, M., & Teo, T. S. H. (2000). Factors influencing the adoption of internet banking. *Journal of the Association for Information Systems*, *1*(5), 1–42.

Venkatesh, V., & Davis, F. D. (2000). A theoretical extension of the technology acceptance model: Four longitudinal field studies. *Management Science*, *46*(2), 186-204.

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: toward a unified view. *MIS Quarterly*, *27*(3), 425–478.

Yang, K. (2012). Consumer technology traits in determining mobile shopping adoption: An application of the extended theory of planned behavior. *Journal of Retailing and Consumer Services*, *19*(5), 484–491.

Yang, K. C. C. (2005). Exploring factors affecting the adoption of mobile commerce in Singapore. *Telematics and Informatics*, *22*, 257–277.

Yang, Y. Q., Liu, Y., Li, H. X., & Yu, B. H. (2015). Understanding perceived risk in mobile payment acceptance. *Industrial Management and Data Systems*, *115*(2), 253–269.

Zarmpou, T., Saprikis, V., Markos, A., & Vlachopoulou, M. (2012). Modeling users' acceptance of mobile services. Electronic Commerce Research. *Electronic Commerce Research*, *12*(2), 225–248.

Zhang L., Zhu, J., & Liu, Q. (2012). A meta-analysis of mobile commerce adoption and moderating effect of culture. *Computer Human Behavior*, *28*, 1902–1911.